



# National Transportation Safety Board

## The Critical Role of Sleep to Enhance Transportation Safety: NTSB Investigations and Recommendations

Mark R. Rosekind, Ph.D.  
Board Member

Maryland Sleep Society Annual Meeting  
April 25, 2014



- 1) determining the probable cause of transportation accidents**
- 2) making recommendations to prevent their recurrence**



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All Modes



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# PG&E/San Bruno Gas Pipeline Explosion

- 8 fatalities
- 10 serious injuries
- 48 minor injuries



- 108 homes affected
  - 38 destroyed
  - 17 sev - mod damage
  - 53 minor damage



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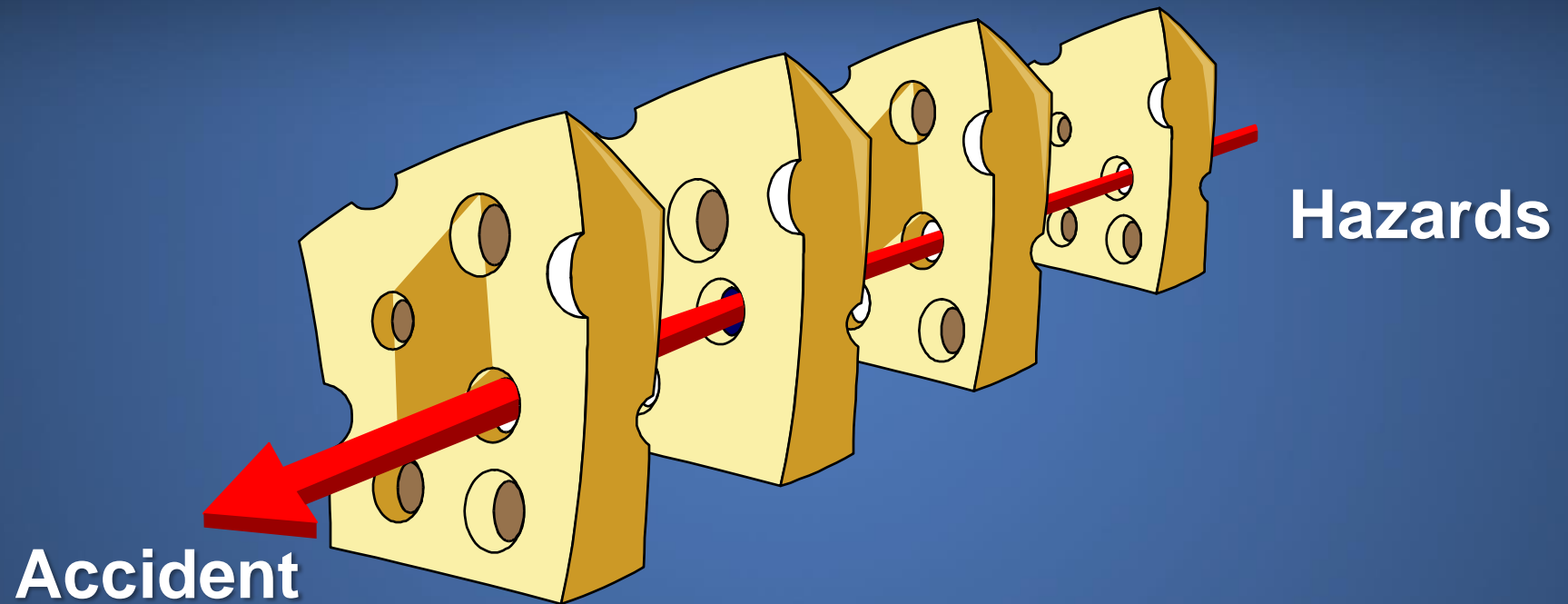


# Independent Federal Agency: Created in 1967

- >132,000 accident investigations
- 13,500+ safety recommendations
- ~ 2,500 organizations/recipients
- 82% acceptance rate



# “Swiss Cheese” Model (Reason)



Successive layers of defenses, barriers, and safeguards



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# Commercial Vehicle Collision with Passenger Vehicle and Motor Coach (Orland, CA; 4/10/14)



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# NTSB Investigative Process



## On-scene Investigation

Organizational Meeting  
Groups and Parties  
Progress meetings  
Media Briefings  
Press Releases

A screenshot of the NTSB ID CARD (Form 1) for Continental Airlines Flight 3402. The form includes fields for aircraft information, flight details, and a summary of the accident. The accident occurred on February 12, 2009, at Buffalo Niagara International Airport (BUF), Buffalo, New York. The aircraft was a Bombardier CRJ-900, registration N4020G. The flight was from Buffalo to New York City. The accident was a controlled flight into terrain (CFIT) during a low-visibility approach.

## Preliminary Report

Factual information



## Public Hearing

Fact finding  
Depositions  
Witnesses  
Docket



## Board Meeting

Docket  
Findings  
Conclusions  
Probable Cause  
Safety Recommendations



## Final Report

**Government in the Sunshine Act**



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# NTSB Characterized as:

‘moral compass and industry conscience’

NTSB Chairman Deborah A.P. Hersman



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# Challenges of a 24/7 Society



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# Uncontrolled In-Flight Collision with Terrain

## AIA Flight 808, Douglas DC-8-61, N814CK

### U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

First NTSB aviation accident investigation  
to cite fatigue as probable cause



- acute sleep loss, sleep debt, circadian disruption



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Uncontrolled In-Flight Collision with Terrain  
AIA Flight 808, Douglas DC-8-61, N814CK  
U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

“The National Transportation Safety Board determines that the probable causes of this accident were the impaired judgment, decision making, and flying abilities of the captain and flight crew due to the effects of fatigue...”



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# Four Fatigue Factors +

- Sleep loss
- Continuous hours of wakefulness
- Circadian/time of day
- Sleep disorders
- Other considerations



# Miami, Oklahoma (June 26, 2009)

## Fatigue Factors

- Off work for 3 weeks: day active/night sleep schedule
- 3am to 3pm shift work/drive schedule (since 1997)
- Early bedtime (2 hr phase advance in sleep time)
- Obtained min 3 hrs/max 5 hrs sleep prior to accident
- Subsequently diagnosed with mild sleep apnea





10 fatalities  
3 serious injuries  
2 minor injuries  
5 no injuries

**Ford  
Windstar**



**Hyundai  
Sonata**

**Kia  
Spectra**

Source: Oklahoma State Police

# Probable Cause (fatigue)

“ . . . driver’s fatigue, caused by the combined effects of acute sleep loss, circadian disruption associated with his shift work schedule, and mild sleep apnea, which resulted in the driver’s failure to react to slowing and stopped traffic ahead by applying the brakes or performing any evasive maneuver to avoid colliding with the traffic queue. . . . ”







**National  
Transportation  
Safety Board**

## **Track Path Animation**

Collision Between Two BNSF Railway Freight Trains

Red Oak, Iowa

April 17, 2011

DCA11FR002



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# Probable Cause (fatigue)

“ . . . failure of the crew of the striking train to comply with the signal indication requiring them to operate in accordance with restricted speed requirements and stop short of the standing train because they had fallen asleep due to fatigue resulting from their irregular work schedules and their medical conditions.”





# National Transportation Safety Board

## **Animation of Accident Reconstruction**

### **Motorcoach Run Off Road-Collision with Bridge Signpost**

Interstate Highway 95 Southbound  
New York, New York  
March 12, 2011

HWY11MH005



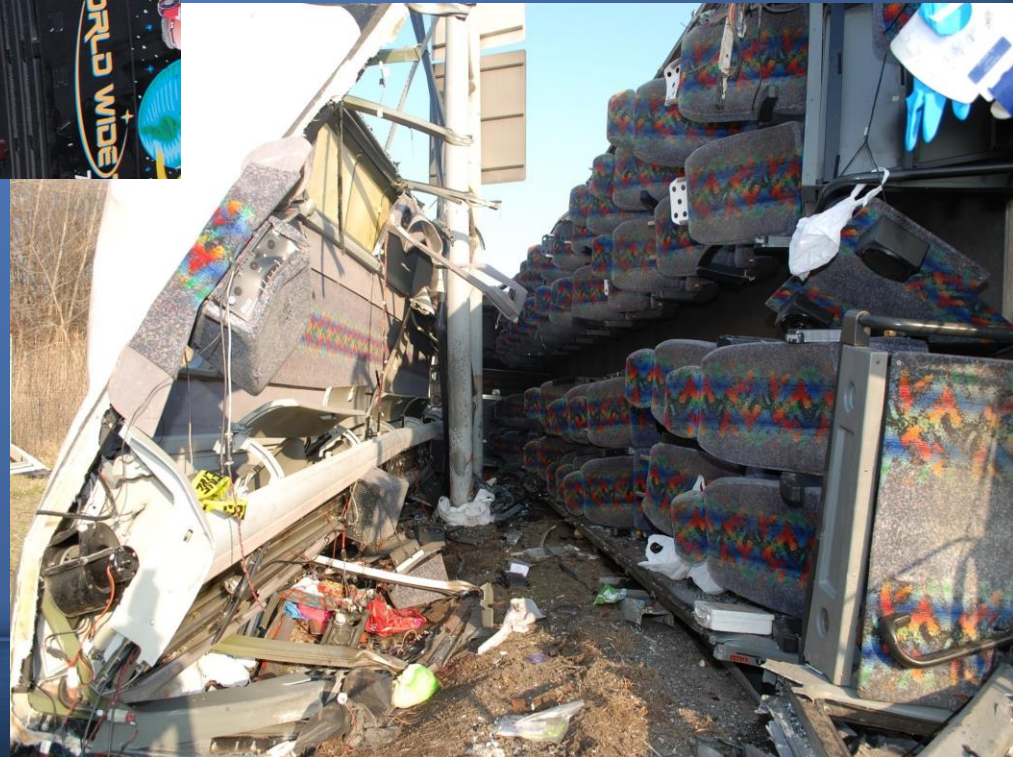
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# 'Bronx Bus', New York, NY (March 12, 2011)



15 fatalities  
17 injuries



# Probable Cause

“The National Transportation Safety Board determines that the probable cause of the accident was the motorcoach driver's failure to control the motorcoach due to fatigue resulting from failure to obtain adequate sleep, poor sleep quality, and the time of day at which the accident occurred.”





# Owatonna, MN (July 31, 2008)



8 fatalities



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# Owatonna Crew Fatigue Factors

- acute sleep loss (Capt/FO)
- cumulative sleep debt (FO)
- early start time (Capt/FO)
- excessive sleep need (Capt)
- insomnia (FO)
- self-medicate/prescription sleep med (FO)



# Probable Cause/Contributing Factors

“Contributing to the accident were . . .  
(2) fatigue, which likely impaired both  
pilots’ performance; . . .”





## NATIONAL TRANSPORTATION SAFETY BOARD

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### MOST WANTED LIST

A program to increase the public's awareness of, and support for, action to adopt safety steps that can help prevent accidents and save lives. The following are ten of the current issues.



Addressing Human  
Fatigue



General Aviation  
Safety



Safety Management  
Systems



Runway Safety



Bus Occupant Safety



Pilot & Air Traffic  
Controller  
Professionalism



Recorders



Teen Driver Safety



Addressing Alcohol-  
Impaired Driving



Motorcycle Safety



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# NTSB Safety Recommendations: Fatigue

- MOST WANTED 1990 - 2011
- ~200 fatigue recommendations



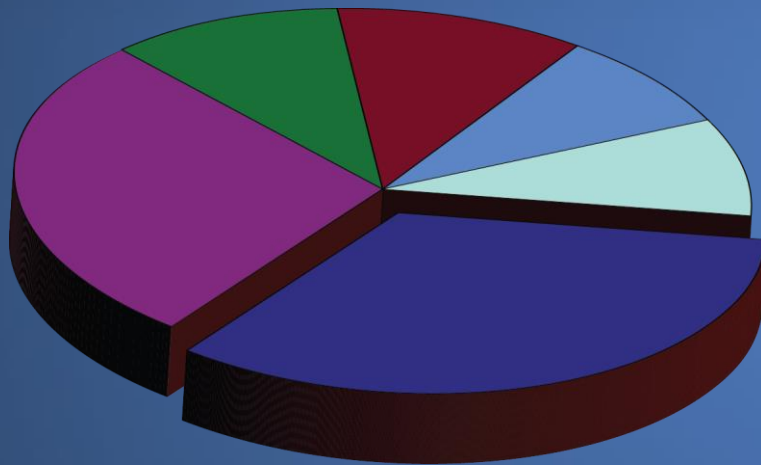
# NTSB Safety Recommendations: Fatigue

- 40 years ago: May 10, 1972
- “Revise FAR 135 to provide adequate flight and duty time limitations.” (A-72-55)
- Classified “Closed-Unacceptable”



# Complex Issue:

## Requires Multiple Solutions



- Scheduling Policies and Practices
- Education/Awareness
- Organizational Strategies
- Healthy Sleep
- Vehicle and Environmental Strategies
- Research and Evaluation





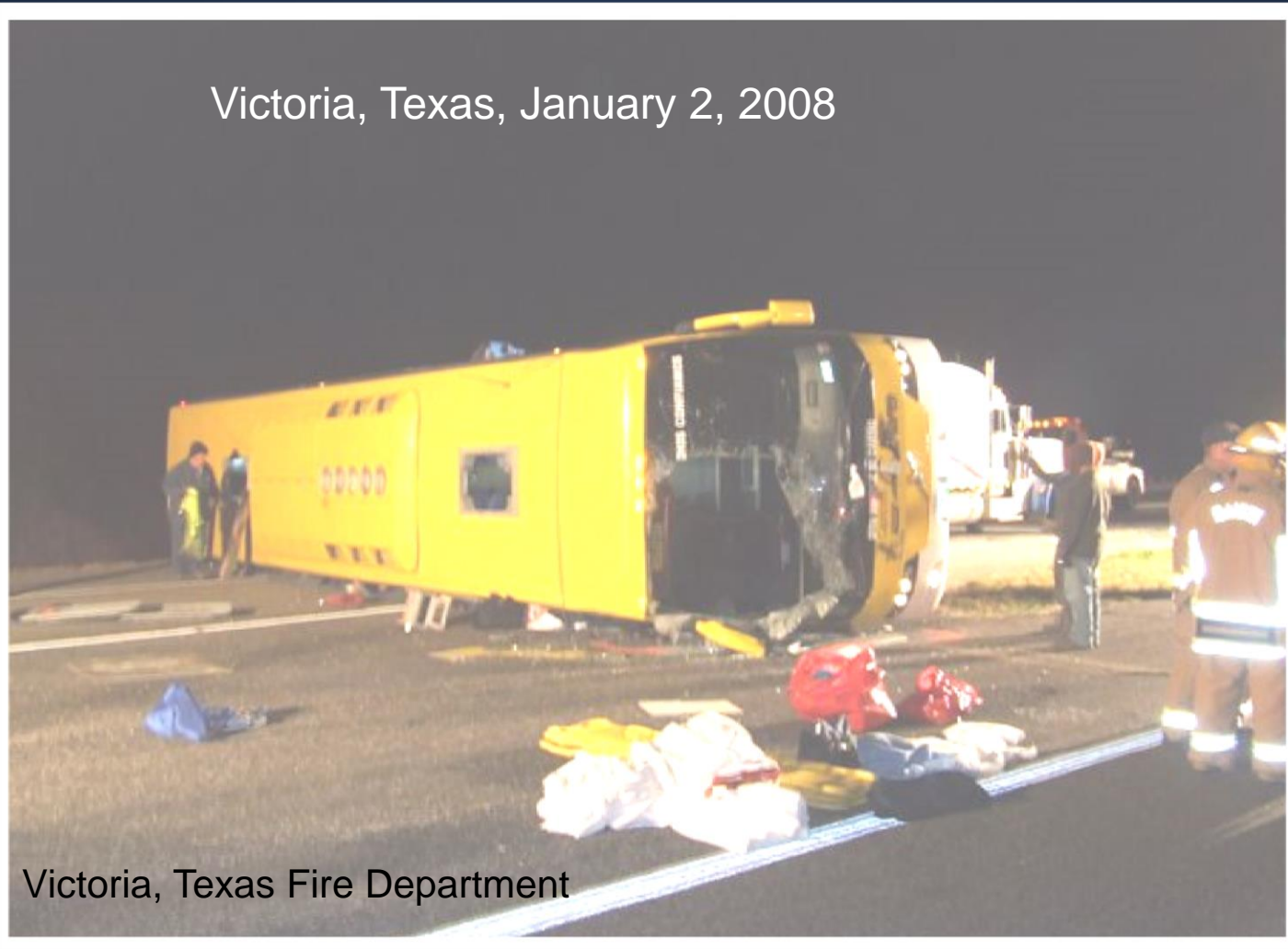
# NTSB Fatigue Recommendations: Education/Strategies

- Develop a fatigue education and countermeasures training program
- Educate operators and schedulers
- Include information on use of strategies: naps, caffeine, etc.
- Review and update materials



# Scheduling Policies and Practices

Victoria, Texas, January 2, 2008



Victoria, Texas Fire Department

- Day sleep, night drive, ~ 4 am WOCL



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# NTSB Fatigue Recommendations: Hours of Service / Scheduling

- Science-based hours of service
- Allow for at least 8 hours of uninterrupted sleep
- Fatigue mitigation strategies in the hours-of-service regulations for passenger-carrying drivers who operate during the nighttime window of circadian low
- Reduce schedule irregularity and unpredictability





# Sleep Apnea

Mexican Hat, UT, January 6, 2008



- 360 rollover, 50/53 ejected, 9 fatalities, OSA (-CPAP)



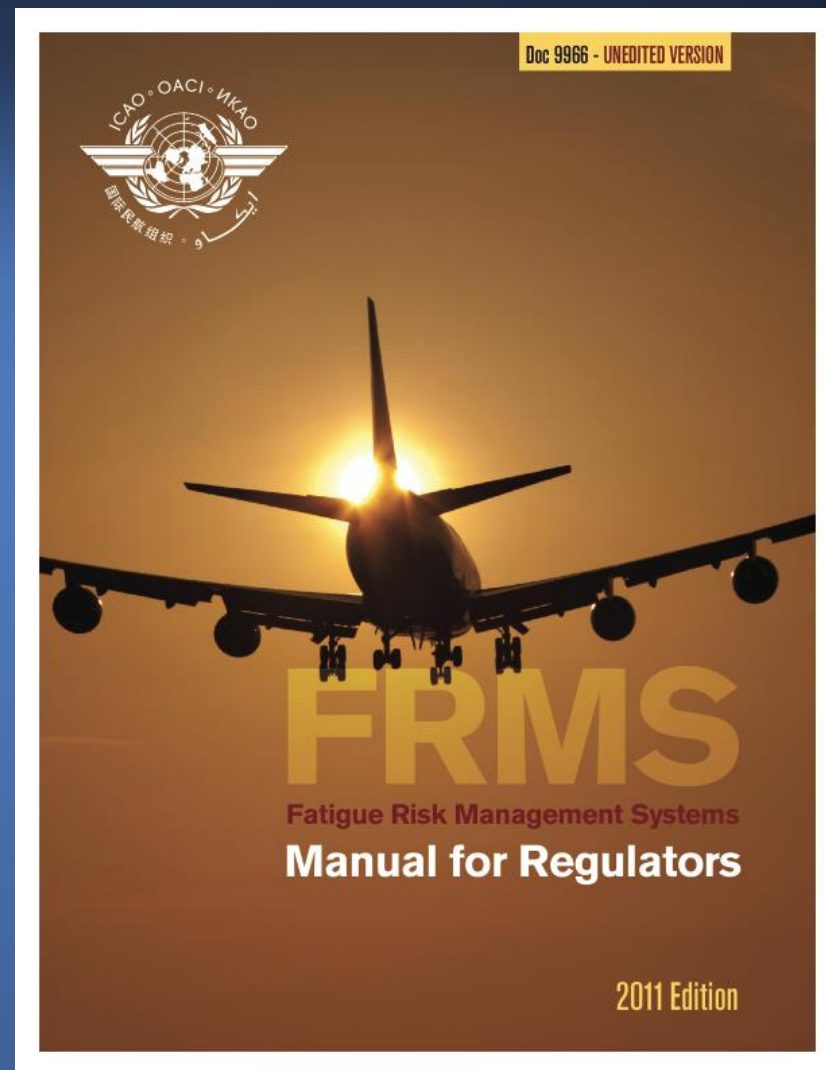
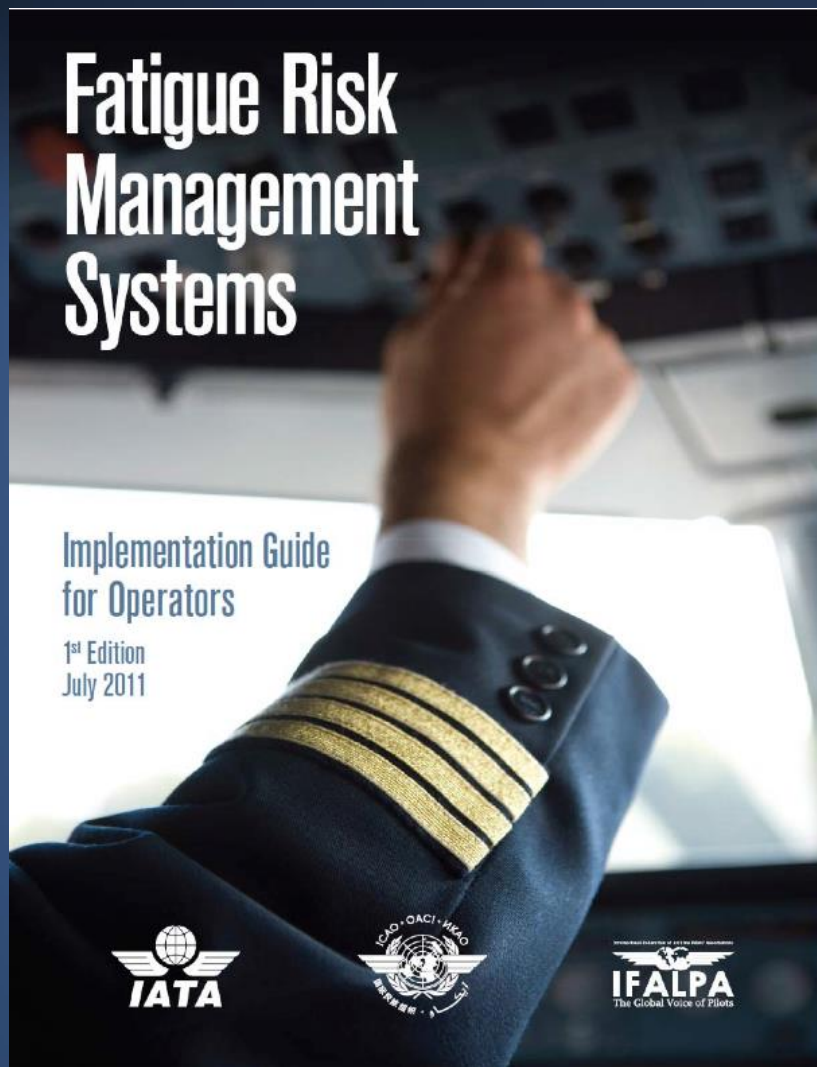
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# NTSB Fatigue Recommendations: Sleep Apnea/Health Related

- Develop standard medical exam to screen for sleep disorders; require its use
- Educate companies and individuals about sleep disorder detection and treatment, and the sedating effects of certain drugs
- Ensure drivers with apnea are effectively treated before granting unrestricted medical certification



# Examples



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# NTSB Fatigue Recommendations: Fatigue Management Systems

- Develop guidance based on empirical and scientific evidence for operators to establish fatigue management systems
- Establish an ongoing program to monitor, evaluate, report on, and continuously improve fatigue management programs implemented by motor carriers to identify, mitigate, and continuously reduce fatigue-related risks for drivers.



# Go! Flight 1002



- early starts, multiple segment days, sleep apnea



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1. modify the Application for Airman Medical Certificate to elicit specific information about any previous diagnosis of obstructive sleep apnea and about the presence of specific risk factors for that disorder (A-09-61)
2. implement a program to identify pilots at high risk for obstructive sleep apnea and require that those pilots provide evidence through the medical certification process of having been appropriately evaluated and, if treatment is needed, effectively treated for that disorder before being granted unrestricted medical certification (A-09-62)
3. develop and disseminate guidance for pilots, employers, and physicians regarding the identification and treatment of individuals at high risk of obstructive sleep apnea, emphasizing that pilots who have obstructive sleep apnea that is effectively treated are routinely approved for continued medical certification (A-09-63)







from the Federal Air Surgeon's  
***PERSPECTIVE...***

BY FRED TILTON, MD



## NEW OBSTRUCTIVE SLEEP APNEA POLICY

*Untreated obstructive sleep apnea is a  
disqualifying condition for airmen and air  
traffic control specialists.*

*OSA is almost universal in obese individuals who have  
a body mass index over 40 and a neck circumference of  
17 inches or more, but up to 30% of individuals with  
a BMI less than 30 have OSA. —Fred*

(December 2013)



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# Strong Industry Opposition . . .

I am... writing...to protest...  
implementing a new obstructive sleep apnea policy...

Mark R. Baker  
President & CEO



**FLYING**

EAA, AOPA Condemn Sleep Apnea Rule  
By Pia Bergqvist / Published: Nov 21, 2013

**MIDWEST FLYER.COM**

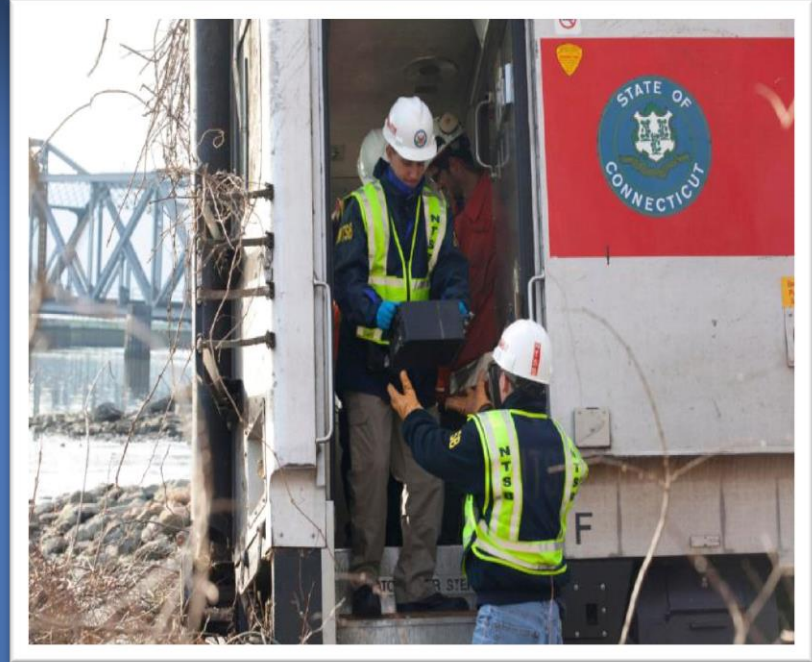
EAA Says FAA's Sleep Apnea Policy Would Set A Dangerous Precedent  
November 26, 2014 by mwflyer



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# Bronx Metro North Train Derailment (12/1/13)

- 4 lives lost
- 54 injuries
- \$9 million in damages
- NTSB – ongoing investigation



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# NTSB Preliminary Report

- Completed on-scene investigation
- Estimated train speed: 82 mph at curve
- Posted speed: 30 mph
- No problems identified: signal system, train brakes, other mechanical equipment
- Tracks in derailment area: fine
- All cars on train and locomotive derailed
- Recorders sent to NTSB labs for analysis





750 - NYDailyNews.com

# DAILY NEWS

NEW YORK'S HOMETOWN NEWSPAPER

Metro-North engineer 'basically nodded' just before fatal train derailment: Union official

The New York Times

Train Engineer Was Dazed Before Crash, Lawyer Says

LONG ISLAND

**Newsday**

Metro-North engineer 'caught himself' nodding before crash, union official says



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# CTA Crash – O'Hare Airport (3/24/14)

- 32 injured
- \$6 million estimated in damages
- NTSB ongoing investigation
- NTSB: Operator reported falling asleep



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CTA Crash – O'Hare Airport (3/24/14)



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# NTSB Preliminary Investigation

## CHICAGO SUN-TIMES

**CTA operator awoke 'when she hit,'  
dozed off before, NTSB says**

BY STEFANO ESPOSITO AND ROSALIND ROSSI Staff Reporters March 26, 2014 10:21AM

Chicago Tribune

• — **BREAKING NEWS** — •  
**NTSB: Operator in O'Hare crash had  
fallen asleep at controls before**

## Los Angeles Times

**Driver in Chicago subway train crash had 'dozed  
off,' NTSB says**

By Paresh Dave  
March 26, 2014 | 9:27 a.m.



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# Manage Sleep = Enhance Safety

- Acknowledge risks
- Educate everyone
- Strong policies
- Take action/use strategies!
- Promote culture change





# #40 Ceremonial Swearing In



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Good sleep, safe travels.



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